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ABSTRACT

The report presents a framework for the application of a curriculum model to computer programs designed for special education students, specifically slow learners and learning disabled students in regular and special education classes. The program content includes selected basic skills instructional components that are transferable to a computer. The instructional model used is Gagne's algorithm which reflects cognitive learning theory. There is a discussion of the integrative nature of the program and an explanation of program design including data regarding student and teacher response. (General and sample lesson plans for both mathematics and the language arts are included; instructional computer program names are listed with brief comments.) (Author/CL)

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CABS PROJECT

COMPUTERS AND BASIC SKILLS

A Design Model for Writing Computer Programs that teach the Basic Skills to LD and SL Students

July, 1984

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This report presents a framework for the application of a curriculum model to computer programs designed for special education students, specifically slow learners and LD students in regular and special education classes. The program content includes selected basic skills instructional components that are transferable to a computer. The instructional model used is Gagne's algorithm which reflects cognitive learning theory. There is a discussion of the integrative nature of the programs and an explanation of program design including data regarding student and teacher response. Computer programs and fieldtest data are also included.

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INTRODUCTION

There are computer programs in curriculum but there is little curriculum in computer programs.

Computers have captured the attention of educators and the increased availability of software has caused teachers to look to computers as tools that individualize and enhance instruction. While the over-all potential of computers is vast, it is in the area of individualized instruction that computers may have the strongest impact. But, educators have not maximized their potential in this area. They often feel intimidated by what they perceive to be complex technology needed to write and use individualized instructional programs. Therefore, educators have relied on commercial companies to develop the software. However, this need not be the norm. It is possible for all teachers to develop thoughtfully designed programs that parallel their lesson plans while also reflecting a consistent theoretical base. By applying their knowledge of learning theory and educational psychology to a curriculum model, educators can design and tailor programs to meet their individual needs.

While all teachers must address the individual needs of their students, the need for individualized instructional materials may be most evident in the area of special education. Certain conditions existing in Louisiana have caused educators to investigate the application of computers to curriculum programs that focus on the individual instructional needs of this population.

A radical change in Louisiana Bulletin 1508, the criteria used for classifying special education students, has resulted in the elimination of the slow learner classification. Although slow learner is not a category identified by PL 94-142, the Louisiana legislature chose to include this classification in their special education statute. The elimination of this classification has created several problems. Students previously eligible for services under the old guidelines will now remain in regular education classes. Students presently classified as slow learners will continue to be serviced through the IEP with an emphasis on mainstreaming.

The state realized that the placement of the slow learner in the regular education classroom would place an additional responsibility on the regular education teacher. Not only would the teachers need to deal with the special needs of these students, but would also deal with the state Basic Skills mandate. According to state law, students in regular education are required to participate in minimum competency testing in order to acquire a high school diploma. As a way of helping the regular education teachers, the state decided to study the relationship between computers and basic skills instruction. The purpose of this project is to address the issue of computer lesson design and the basic skills requirements for special education students, including those mainstreamed.

PROJECT DESCRIPTION

Purpose

The purpose of the CABS Project, Computers and Basic Skills, was to study selected Louisiana Basic Skills instructional components that are transferable to a computer and that can be effectively integrated into regular classes in grades 2 and 3. Also studied was the application of these transferable components to curriculum programs for slow learners in both regular and special education classes, grades 2 and 3. This report describes the project and includes the following:

1. an explanation of a curriculum model that may be used in computer lesson design;
2. the application of this model to Basic Skills computer programs, grades 2 and 3;
3. copies of the lesson plans to accompany programs with an explanation of the integrated nature of the lessons;
4. an explanation of the technique whereby classroom teachers may apply their knowledge of curriculum to computers without knowledge of programming languages;
5. data regarding fieldtesting of programs including student and teacher response;
6. comments about modifications in programs as the result of fieldtesting.

Objectives

The program objectives are as follows:

1. *To identify a curriculum model that can be used as a theoretical underpinning for computer lesson design.*
2. *To select Louisiana Basic Skills components that are transferable to computers.*
3. *To apply the curriculum model to programs that compliment basic skills instruction for slow learners.*
4. *To develop and fieldtest these programs with special education students, including slow learners in regular and special education classes;*
5. *To develop lesson plans that model integrative use of the computer in the classroom.*
6. *To gather data regarding student response/reaction to instruction via computer.*
7. *To develop and fieldtest a unit, Introducing Special Education Students to the Microcomputer, Primary Grades.*
8. *To develop a checklist of minimal computer skills to be mastered by the student prior to participation in CAI programs.*
9. *To develop a list of practical safety/maintenance rules regarding the proper use of a computer.*

Student Population

Eight (8) students were identified for participation in the study. Six (6) were special education students assigned to a resource room and two (2) were Chapter I students. It should be noted that the Chapter I

students had serious academic deficits and were subsequently evaluated. According to the criteria in the original Bulletin 1508, these students would have been classified as slow learners. Six (6) of these students had taken the state basic skills tests and all had failed portions of the test.

For the purpose of the study, students were divided into sub-groups. All students participated in large group instruction; however, small group instruction varied.

Group	#of participants	Student Characteristics	Purpose
A	3	4th & 5th graders in special education-1 SL and 2 LD students	To provide control data re: 1. facility in use of equipment; 2. response to pro-content
B	2	2nd & 3rd grade special education-1 of the students also has hearing impairment	To fieldtest material as part of instructional program.
C	2	2 Chapter I students	Same as group B

* one student was unable to complete study

Curriculum Theory

The theoretical model for program design is Robert Gagne's instructional algorithm and cognitive learning theory. An explanation of Gagne's work is given in the body of this report.

Equipment

TRS-80 Model IV (64K) 2 disk drives with printer

Radio Shack Authoring System, AUTHOR I

Diskettes, computer table, and power strip

AUTHOR I

This authoring system is easy to learn and provides an excellent format for teacher preparation of lessons. The system takes the technical aspect out of the programming situation. Teachers can easily design programs that parallel their own teaching style and compliment their lessons. The only technical concerns are those of frame control and content presentation. Teachers are faced with similar decisions when planning routine lessons and Burke's CAI Sourcebook provides teachers with guidelines for writing computer lessons.

THEORETICAL MODEL FOR COMPUTER LESSON

Thoughtfully designed computer lessons must reflect a balance between learning theory and educational psychology. The use of machines as instructors introduces a unique set of conditions into the instructional setting. This also poses a unique set of problems regarding instructional design. Educational programmers must isolate teaching strategies that can be effectively transfered to a computer while also considering the psychological aspect of learning via a machine.

Robert Gagne has developed a curriculum algorithm that can be used in computer lesson design. The model suggests that learning is cued by a series of external events. Given below is Wager's (1981) observations about the 9 steps in Gagne's algorithm. A diagram representing the algorithm is given.

Gagne's Algorithm

Step 1 Provide for attention/motivation

Motivation is interpreted as providing the instructional focus. Introductory frames give the motivating display.

Step 2 Present the objectives to the learner

Programmer answers the question: What are you trying to teach?

Step 3 Recall prerequiste skills

Pelate old to new lesson or present entry level skills test.

Step 4 Present new stimulus material

Information in this step depends on the objective. Programmer must consider which type of information is essential. Options include: verbal information, defined concepts, rule using, and problem solving.

Step 5 *Provide learning guidance*

This step involves expansion of information.

Step 6 *Elicit Performance*

It is critical that performance objective is congruent with instructional objective.

Step 7 *Provide feedback*

This is related to type of learner and type of learning including knowledge of correctness, reinforcement, elaborated feedback, etc.

Step 8 *Assess performance*

Contains criterion for the demonstration of the new behavior; learner is to demonstrate mastery.

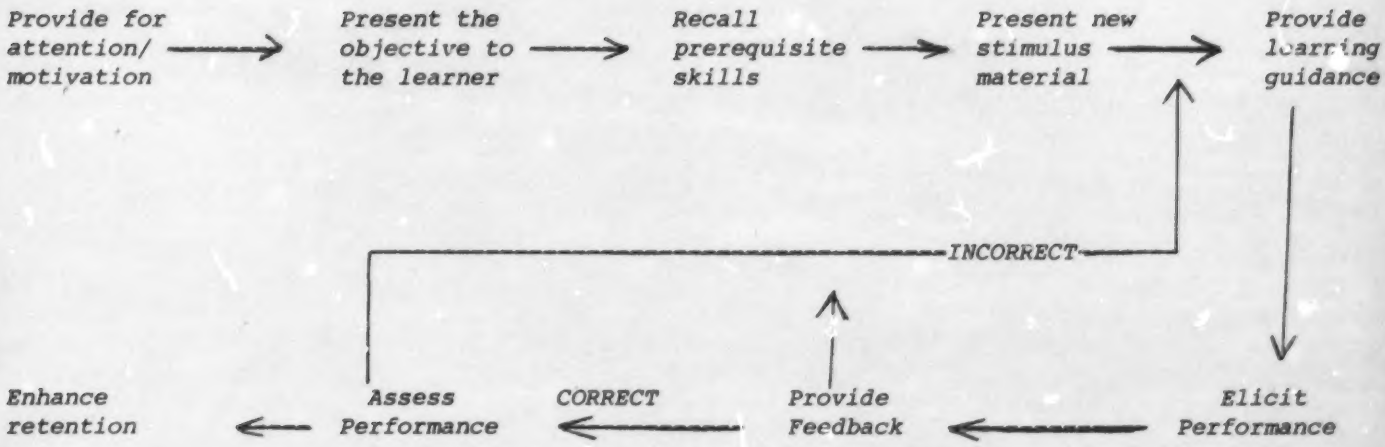
Step 9 *Enhance retention and transfer*

Student/learner is to practice skill.

These 9 different events of instruction always need to be considered as potential ways of providing external support to learning. The chart given below shows the relationship between the internal processes of learning and the external events which may be used to support them.

INTERNAL LEARNING PROCESS	*EXTERNAL INSTRUCTIONAL EVENT*
1. Alertness	*1. Gaining attention*
2. Expectancy	*2. Informing learner of lesson objective*
3. Retrieval of working memory	*3. Stimulating recall of prior learning*
4. Selective perception	*4. Presenting stimuli w/distinctive featur*
5. Semantic encoding	*5. Guided learning*

6. *Retrieval and responding*	6. *Eliciting performance*
7. *Reinforcement*	7. *Providing informative feedback*
8. *Cueing retrieval*	8. *Assessing performance*
9. *Generalizing*	9. *Enhancing retention and learning transfer*



GAGNE'S ALGORITHM

PRE-PILOT RESEARCH

Before beginning the project using special education students, the researcher gathered data regarding the response of regular education students to computer instruction. A short, two part introductory lesson was developed and 8 students*were chosen to participate. A general outline of the lesson is given. It should be noted that the purpose of the lesson was to observe, informally, student reactions and to record comments. The material was presented in a relaxed manner and students were given all the help needed to achieve success. Students worked individually with the researcher and programs included short activities that encourage student interaction with the computer.

Lesson Outline
Part A

1. Ask the student if he is familiar with computers, i.e., has he used computers at home, in an arcade, etc.?
2. Show the student the school computer.
3. Explain the purpose of the lesson, i.e., you are going to let the student use the computer while you help.
4. Show the student the disk. Then load the computer using the disk The student can turn on computer and assist if familiar with process.
5. Explain that you will type words that will get the computer started.
6. Load the game, GUESS. It is a game found in the TRS-80 manual.
7. Read the introduction of the game with the student and then explain the purpose of the game. In this game the numbers 1 and 2 appear in a random sequence on the screen. The student is to guess which number will appear next. Student needs to know the location of the number keys on the numeric keypad section of the keyboard.

8. *Help the student play the game.*

9. *Watch student's coordination particularly his ability to enter numbers. You need to also note the student ability to attend to the screen and distractions when frames change or the student must search for number keys.*

10. *Remind the student to press ENTER key each time he enters a response. Explain to the student why this is necessary and observe the degree to which he comprehends the task.*

11. *Change the program and show the student how to write his name on the screen. Observe student's interest in this task and his ability to perform the task correctly.*

12. *Talk about the student's ability to control the machine. Note interest in this concept. Give the student examples of user control functions.*

13. *Show the student how to change print position on screen by varying punctuation.*

14. *Allow student to enter name and select print position, then run program.*

15. *Load STARFALL game. This game in found in TRS-80 manual. This game introduces an arcade-effect. Watch student's response to effect; discuss impressions with him.*

16. *Show student how to stop STARFALL game. Remind student that this is a way for him to control machine.*

17. *Ask student to tell you how to turn off machine. Help student do this.*

18. *Discuss student's perceptions and impressions. Inquire about reaction to activities as well as over-all interest in the computer.*

19. *Ask student if he would like to return for an additional lesson.*

20. *Thank student for his help and set up next appointment if student is receptive.*

Part B

1. Ask student what he remembered about the last lesson. Encourage student to discuss his experiences.
2. Have student turn on computer and load the disk. Review steps and assist student if necessary.
3. Ask student what game he would like to play. He may chose to try a new game or play a game presented in the first lesson.
4. Check student's responses to assess retention of information/skills from first lesson.
5. Follow a similar set of activites as outlined in part A.
6. If the student wants to play a new game you may use one printed in the TRS-80 manual or use a commercially prepared game.
7. Bring closure to the lesson. Remember to be positive about computers.

* The eight (8) regular education students selected for the pre-pilot activities were chosen for the following reasons:

1. These students were in the regular education primary grade classes. This age group parallels the experimental group.
2. The students' academic levels varied. The researcher wanted a wide range of abilities so comparisons could be made.
3. All students knew the researcher and felt comfortable in this type of one-to-one setting. Students were told that they were chosen because they were special in a positive way.
4. Parents and teachers support the project and would share information with the researcher.

As the children were unique individuals, were generally unfamiliar with the computer, and the purpose of the activities was to observe only, the results of the lessons will be presented in the form of indicators and not generalizations. However, the indicators and observations were considered as the researcher planned project activities.

General Comments and Observations

1. All the students enjoyed playing computer games. Only one student became annoyed when he started losing. One student did not want to participate in any activities unless it was a game.
2. Most students were able to follow the directions for loading the disk, turning on the machine, etc. and were able to remember certain tasks. Most students remembered how to turn computer on/off and that the disks must be handled carefully.
3. None of the students felt comfortable loading the disk by themselves.
4. Only one student had played an arcade game. One student had a video game at home but couldn't remember if it was a computer.
5. Most students wanted to know "how the computer did that!". They did not perceive themselves as controllers of the game. They did not seem to be intimidated; they just thought the machine automatically controlled the next actions.
6. Many of the students commented on the graphics and some found them to be distracting, i.e., students complained of losing their place.
7. Many students lost their place when they looked at the keyboard to enter an answer. Since the students were not familiar with the keyboard, there was a delay when entering a response.

8. A few students experienced difficulty in hitting a single key. This appears to be a muscle control problem rather than an error in entering data.

9. Many students were visibly pleased about their performance. All students said they had talked to teachers and parents about the computer.

10. The students who were weaker academically had difficulty with commands. They appeared to be more comfortable when tasks required single commands or entries.

Sequence of Lessons

1. The first series of lessons were those from the unit, Introducing Special Education Students to the Microcomputer and included large group instruction as well as paired activities. Students were encouraged to help one another and an adult was present during the activities.
2. Once the students mastered minimal computer skills, the basic skills lessons were started. As these lessons were designed to be integrated into regular classroom instruction, the teacher presented the concept within the normal lesson. The teacher's lesson format paralleled the presentation of the material in the computer lesson. Math lessons were presented first. Later students worked with the language arts series. The adult monitored the student's response and intervened when necessary. In some cases program changes were made as the result of student response.
3. Intersperced among the basic skills lessons were other original and commercially prepared programs. Students were free to choose other lessons. This gave the students an opportunity to use their computer skills and to develop a sense of independence. As students acquired this independence, they were allowed to work with the computers housed in the school library. Students perceived this as a reward in that the librarian provided minimal supervision and the ability to work independently indicated a certain trust in the student's skills. Periodically students were given certificates or rewards. However, the distribution of rewards, etc. was closely monitored so that they reflected true success by the student not just intermittent reinforcement.

Observations and Student Responses

Initial Lessons

1. *Students were familiar with the concept of a computer and were anxious to use one. However, few students had actually used a computer or an arcade game. Students did not perceive the computer as an instructional tool.*
2. *Some students had difficulty learning the steps involved in loading and unloading the computer. All students were able to master the skills; but, few were interested in learning correct terminology. There was little interest in the technical aspect of the computer.*
3. *Some students experienced physical problems when using the keyboard. Students with stubby fingers and those with motor control problems had difficulty in striking the keys properly. Errors such as these frustrated the students as they knew the correct response but were unable to enter accurately.*
4. *Students worked with both membrane and full-stroke keyboards. All students preferred the full stroke keyboard as they could feel the key action. While the membrane keyboard is less likely to be damaged by the students, students had trouble "feeling" the keys and holding key position.*
5. *Students were not familiar with the key locations on the keyboard. The search for the correct keys slow entries significantly. This delay in entering information such as a student's name caused frustration. Students seem to do better when responses involved a single key stroke. Students did enjoy seeing their name on the screen so the time required to complete this lengthy entry was worth the results.*

6. Since the computer is a visual medium, students had to adjust to the visual screen presentation of reading material. Students were unable to use familiar techniques for following the next; they were unable to use fingers as line guides. Students adapted readily to text cofiguration/letter formation presented on the screen.

7. Students varied in their ability to see the interaction aspect of the computer. Some students understood the relationship between their response and computer response. Others believed that the computer controlled the learning. Two students frequently questionned the computer response, i.e., they asked why the computer did something.

8. Graphics in computer programs can be both motivating and distracting. Too much movement on the screen can cause a student to lose his place or to become too involved in the graphic thus losing sight of the lesson. However, a graphic that is linked with a positive reinforcement appears to be effective. Mixing graphics within the frames can give students a "little surprise" in a lengthy lesson.

9. Students needed to learn procedures for correcting errors and interrupting programs. Students must know how to correct a mistake quickly without stopping the program. Additionally, students needed to know common error messages so they could respond and continue the lesson flow. Students learned these skills quickly as they did not want anything to stop their lesson.

10. The use of wall charts, etc. as references to help students learn the keyboard, commands, etc. was very ineffective. Students wanted to touch the machine; "hands on" time was most important to them.

Observation and Student Responses

Instructional Programs

1. *Some students experienced difficulty in reading vocabulary words. It is important that the teacher review vocabulary words before the computer lesson and follow up with a short computer program presenting the words on the screen. Some students were able to identify the words on a chalkboard, but were unable to recognize these words on the computer screen. A little practice resolved this problem.*
2. *Two of the students had very short attention spans. Although they were enthusiastic about the project, there interest waned as the project progressed. It was necessary to shorten the lessons for these students.*
3. *Students displayed a varying interest in typing. Most students felt more comfortable with single key responses. All enjoyed typing their entire name but did not like to type lengthy answers. Students preferred numeric entries over alphabetics. It was more difficult for them to locate letter keys that number keys on the numeric keypad.*
4. *Students maintained their interest throughout the study. They liked graphics and enjoyed both the instructional and play aspect of the computer lessons. Because the programs were designed to be intergrative in nature, students were able to experience a sense of independence while receiving support from the teacher. Computer programs were used routinely but not repetitiously.*
5. *Initially the students enjoyed regular positive feedback. However, after a few lessons, they did not seem to enjoy this. Intermittent positive reinforcement appeared to be adequate. This allowed a fluidity to the*

programs. All incorrect responses were so identified.

6. Students enjoyed programs that provided a score. Periodic information such as sub-totals appeared to be adequate reinforcement.

7. The program writer must control the amount of information presented in each frame. Too much information becomes a distractor. Students get lost in the information. The visual presentation via a screen limited the students ability to use guides or markers to help them keep their place. Positioning of information is also critical. Students preferred consistent placement of data from screen to screen. Some variation relieves the tediousness of a long lesson, but, consistency of frame material is essential.

8. All directions for programs should be included in the lessons. If a series of programs are written in a consistent format, students will be able to review directions and begin work promptly.

9. The hearing impaired student was very comfortable with the computer. This student maintained a high interest level throughout the study and showed the greatest academic improvement. The student identified as a slow learner but not classified because of the changes in state guidelines, experienced the most difficulty in using the computer. This student was use to extensive one-to-one tutoring situations and did not have a sense of independence about his work. He wanted constant human reinforcement. Working with the computer added a new dimension to his instructional program, but he had difficulty adapting.

10. The program writer should limit sentence structure. There must be adequate spacing between sentences. Students lost their place when the sentences were lengthy.

11. *Some students consistently misread certain vocabulary words. The word TYPE was misread as TAPE and the word READY was read READ. The unique letter formation of computer print contributed to this problem.*

12. *The program writer must control the vocabulary. Student response caused the researcher to re-word several frames. Examples of changes are: the word ANOTHER was re-word so that the directions/commands read "one more"; the word REVIEW was changed to "go over" or "look at". As students mastered the computer and their attention focused on the lessons, the vocabulary level could be increased as in any other type of instruction.*

Lesson Design

Practical Considerations

Robert Burke in his CAI Sourcebook recommends that consideration be given to the following areas of lesson design.

1. *Directions*

   Provisions must be made for clear and consistent directions. Students must know what to do next; otherwise, they may get lost in the lesson. Programs should have back-up systems in case the student fails to understand the directions or simply forgets them. The need for extensive directions is decreased if the procedures are consistent.

2. *Succession*

   Be cautious about programs that have extensive succession and timed messages appearing on the screen. It is difficult to predict the amount of time a student may need per screen and timed frames often make the students feel that they do not have control over the program. However, timed frames may be used effectively when speed is a factor as in timed multiplication drills. Where possible,programs should allow for student control of frame succession and provide ways in which the student may preview or review screens.

3. *Format*

   The size of a computer screen limits the amount of material that can be displayed. It is better to place a small amount of information on the screen at one time. Too much information is distracting or confusing to the student. Slight variations from screen to screen can help the student remember if he has responded to this frame. However, this consideration is important only if many frames are repetitious in content.

4. *Anticipated Correct and Incorrect Responses*

Program designers must provide for feedback. Correct responses should provide positive reinforcement. Writers must plan in advance for incorrect responses so the student is not left stranded in the lesson. Remedial sequences can follow incorrect responses. This is achieved by branching techniques.

5. *Unanticipated Responses*

It is impossible to anticipate all possible responses; therefore, program writers must give students options when problems arise. option lines such as "Press 1 if you do not understand" will provide an exit for a confused student.

6. *Null Response*

In some programs, it is beneficial to provide HELP frames. These frames can help a student locate his place, exit the program, etc. A timed frame may be useful in the case of no response. This frame can automatically exit a student after a time delay.

7. *Response Latency*

Response latency is the time that elapses from the student's first opportunity to respond until he actually does respond. Research indicates that the longer it takes a student to answer, the more likely the response will be incorrect. Authors sometimes write hints that are given as the response time exceeds the average.

8. *Branching*

This refers to the logical flow of the lesson, including the alternate paths. Branching can be done automatically as a contingency of student performance or it may be openly provided as an opportunity

for the student to make his own decisions affecting the course of the program.

9. *Special Techniques*

Inverse video helps create distinctions between two kinds of information that appears on the screen. Blinking can be used to highlight words/graphics.

General Lesson Plan for Math Series

Goal: To develop a series of lessons that teach the concept of addition.

Objectives:

1. *To develop lessons that reflect the instruction provided by the teacher.*
2. *To design programs that can be integrated into regular classroom instruction.*
3. *To design programs that teach the Basic Skills as identified by the Louisiana State Department of Education.*

Vocabulary:

objects	*addition*
number sentences	*problems*

The vocabulary in all the lessons is controlled and repetitive. Sentence structure is also simple and repetitive. This format helps students become accustomed to the presentation of material.

Procedures: *Following Gagne's algorithm, the lessons begin with the known. This series of programs present the concept of addition. Students are expected to go beyond the idea of simple addition. Students are to demonstrate a facility in solving problems and writing number sentences. The inclusion of graphics provides a visual link with concrete objects frequently used in introductory lessons in addition.*

As the lessons should be part of the total instructional process, care must be given to match the presentation of material. Teachers should use horizontal sentences when explaining number sentences and must clearly identify the objects with the numeral. Worksheets are provided so that the computer work is integrated into the daily work/activities.

Drill and practice lessons are also part of this series. Students need to have an intuitive understanding of addition. But, rapid recall of facts is also important. The computer can be a patient, non-judgmental vehicle that allows additional practice in math facts. Some programs allow students to enter their own name, adding a more personal touch to a repetitive lesson. Additionally, some programs provide a score for the student. This adds a competitive dimension; however, as the students works alone, he is in competition with himself.

*Program Names**

Title	*Content*
INTRO	*Addition lesson, includes counting boxes, etc. Shows transitions from counting objects to counting number sentences.*
INTRA	*Follow-up lesson to INTRO. Students complete written worksheet after lesson.*
INTR 2	*Game format for the review of sums to 10. Zero is not included. Problems presented as number sentences(horizontal presentation).*

INTR3	*Sums 11-20*
INTR4	*Sums 11-20. Reminds students of concepts. Students complete 3 review lessons.*

**Copies of these programs are available from the La. State Dept. of Education, Special Education Dept.*

Sample Lesson Plan to Accompany Computer Lesson: INTRO

Lesson 1

Objectives: 1. *Student will review the concept of addition.*

2. *Student will be introduced to the concept of a number sentence.*

3. *Student will write number sentences.*

Vocabulary:

addition	*number sentence*
total	*sum*
boxes	*objects*

Procedure: *The teacher is to begin by reviewing the one-to-one relationship between an object and a number. The use of objects is a necessary step. Once students have reviewed this concept, the teacher is to draw figures on the chalkboard, further explaining this relationship.*

Following this, the teacher will begin the review of the concept of addition. Using objects and chalkboard figures, the teacher is to show the additive process. The terms, total and sum, should be used. Additionally, the teacher should mark the figures to reinforce counting and to emphasize sum.

The next concept is that of number sentences. Using objects, the teacher should follow this sequence of activities:

a. have students count objects

b. reinforce terms, total and sum

c. have students separate sets of objects into two subsets

d. ask students to count each subset

e. remind students that total does not change

This sequence should be repeated several times.

Then, using the objects as a reference, students are to repeat the activities. However, the teacher is to write number sentences on the chalkboard as representation of the objects. Repeat this sequence. Each sequence should be accompanied by a number sentence recorded on the chalkboard.

Students are to complete worksheet, Number Sentences.

Lesson 2

Objectives: 1. *Students will review math vocabulary and the format for writing number sentences.*

2. *Students will review commands necessary to complete computer lessons.*

Vocabulary: *Same as lesson 1 with addition of these computer terms-*

load	*disk*	*reset*	*break*
enter	*continuation symbol*		

Procedure: *Following the sequence described in Lesson 1, the teacher will review the concept of addition and the format for writing number sentences.*

The teacher will then review concepts related to the use of the computer. Specifics are given in the unit on microcomputers. As students begin lesson, the teacher must monitor the student's ability to load disk, start lesson, and enter/correct a response.

General Lesson Plan for Language Arts Series

Goal: To develop a series of lessons that teach alphabetical order. (The lessons progress from review of the alphabet to the identification of words in alphabetical order.)

Objectives:

1. *To develop lessons that reflect instruction provided by the teacher.*
2. *To design programs that can be integrated into regular classroom instruction.*
3. *To design programs that teach Basic Skills identified by the Louisiana State Department of Education.*
4. *To develop programs that students can use effectively.*

Vocabulary:

alphabet	*letters*
alphabetical order	*type*
keyboard	*cursor*
% score	*arrow key for moving cursor*

The vocabulary in all lessons is controlled. It is important that the teacher reinforce the use of the word, alphabet, and the tern, alphabetical order. When working with the students, it was evident that they relied on the term, ABC's, instead of the word, alphabet. Students need to become familiar with the word alphabet in order to bridge to the concept alphabetical order.

Procedure: *The lessons include a review of the alphabet, practice in the identification of the letter that comes before another as well as after, and identification of words according to alphabetical order. Underlying all lessons is the concept that alphabetical order has a specific use. Students should be told the reason for studying alphabetical order.*

In the beginning lessons, the students are asked to review the letters in sequence. Some students were able to say the alphabet but were not able to identify single letters within the sequence. These students may be given a card with the letters. This will help focus their attention. Some students tried to complete the activities by saying the entire alphabet in order to arrive at a choice. The reference card may help these students.

The worksheets help link the classroom instruction to the computer lessons. Teacher presentations should parallel the content of the programs. Students enjoy programs that give scores. The teacher needs to explain the % score. The teacher can decide what level of score is acceptable. Two programs can be divided into 4 lessons, if the teacher chooses.

The content proceeds as follows: the first lesson reviews the sequence of letters, the next program asks students to identify the letter that follows a sequence, then students are asked to identify the letter that comes before a sequence, and the last program asks students to identify letters in words and select the word that comes first in alphabetical order. The number of letters

in a sequence is gradually reduced so that the student eventually focuses on a single letter. The teacher must decide the pace of the work. Some screens have a great deal of printing; however, if the vocabulary is controlled, the students should not experience Too much difficulty. Most students are able to perform if they are familiar with the activity. Remember, the programs are to be integrated into the regular instruction.

*Program Names**

Title	*Content*
ALPHA1	*Introduction to alphabetical order; game with 4 letter sequence is included.*
ALPHA2	*Similar to ALPH1; but, sequence of letters is reduced to 2 or 3. Students are to identify the letter that comes AFTER a sequence.*
ALPHA3	*Same as ALPHA2, however, the letter sequence is reduced to one. Student is asked to input his name for personal response message.*
ALPHA4	*This is a game with one letter sequences. It includes a HELP provision.*
ALPHA5	*Student is asked to identify the letter that comes BEFORE a sequence. Sequence contains 4 or 5 letters.*
ALPHA6	*Two part program that also contains a game that provides a score. Student is to identify the letter that comes BEFORE a sequence. Sequence is shorter than that in game, ALPHA5*
ALPHA7	*This programs reviews alphabetical order. Students are asked to identify the word that comes first in alphabetical order. Sliding cursor is used and the vocabulary words are from the Harris - Jacobsen word list.*

**Programs are available through the La. State Dept. of Education, Special Educ. Dept.*

DISCUSSION OF RESULTS

The purpose of this study was to study selected Louisiana Basic Skills instructional components that could be effectively transferred to computers and to fieldtest these programs in special education classes for slow learners and LD students. The results of this study are as follows:

1. *Students who participated in the study were able to master the skills necessary to operate the computer.*
2. *The students appeared to be comfortable with the computer and all students maintained their interest throughout the study. The hearing impaired student indicated the highest continuous level of interest and the student who was weakest academically required the most supervision and support. All students developed some degree of independence in in using the computer.*
3. *The AUTHOR I system provides a suitable framework for the design of computer programs by teachers who do not possess programming skills. The programs can be designed to reflect specific instructional needs and there is enough flexibility to modify the presentation of the content according to the student's learning style.*
4. *The teachers indicated that the computer programs can be effectively integrated into the instructional program. Remedial and special education programs emphasize a variety of teaching techniques and materials. The computer fits easily into this diverse structure. Since teachers present information in a variety of ways, the computer material can be easily added to the regular instruction.*
5. *While this study was not designed to measure academic progress, there was some evidence that the programs enhanced the instructional program.*

It should be noted that research indicates that computer instruction helps maintain the level of mastery for remedial students. Computer instruction does not necessarily increase the level of performance. Computers may be most effective when used with other forms of instruction.

RECOMMENDATIONS FOR FURTHER STUDY

1. *Additional programs should be written so that students may participate in a complete instructional series. Pre and Post-testing could provide data regarding computer instruction and academic achievement.*
2. *Consideration may be given to the potential use of computer instruction with hearing impaired students. The computer presents material visually and these students relate positively to this medium.*
3. *Remedial students need to gain independence in their work. Consideration may be given to using the computer to foster independence.*

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